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## THE MORPHOLOGY OF THE ADULT OF DIPRION POLYTOMUM (HARTIG).

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### INTRODUCTION

In 1930, the spruce sawfly, *Diprion polytomum* (Hartig), was found severely defoliating spruce trees in the interior of the Gaspé Peninsula in Quebec. At that time it was estimated that some 2,500 square miles were affected. Since then the infestation has increased in intensity and extent, and in 1936 the sawfly was known to be present throughout most of the spruce forests of north eastern America from the eastern boundary of Ontario to Nova Scotia (1).

Owing to its recent discovery and rapid increase the insect has been considered to be an introduction from Europe. With this in mind the writer studied the external morphology of the adult, partly to enable a comparison between Canadian and European material and partly to determine if there were more than one morphological strain in Canada.

Sawfly material examined in preparing this paper was collected in Bonaventure and Kamouraska counties in Quebec, and near Fredericton, N. B. Variations in structure and colour were negligible. There were, however, variations in size, which, according to Mr. R. E. Balch is largely a matter of nutrition. He found, for instance, that *D. polytomum*, when reared on *Picea Mariana* (Mill) B.S.P. was smaller than when reared on *Picea glauca* (Moench) Voss.

Some *D. polytomum* adults collected in the Republic of Czecho Slovakia were also examined, and certain differences between the male and female genitalia indicated that there are at least two morphological strains in Europe. This phase of the study is still being worked upon, and the present paper deals only with the morphology of the Canadian adult.

*Diprion polytomum* was first described by Hartig in 1834. The synonymy of the genus is as follows:

*Diprion* Schrank, Fauna Boica, Vol. 2, pp 209, 252, 254, 1802.

*Lophyrus* Latreille, Crust. and Ins. 3 : 302, 1802.

A sawfly was also described as *Lophyrus hercyniae* by Hartig in 1837 but this was later considered as a synonym of *Diprion polytomum* (Hartig) by Enslin (2).

The terminology used in the following discussion on the morphology was adopted from Snodgrass' "Principles of Insect Morphology."

*Female—Size*—The average length of the female adult is about 8 mm. with a range of 6 to 9.5 mm.

*Colour characters*—The female is black with yellow markings; the head is black, with vertex, clypeus, supraclypeal area, genae, and scape of antennae yellow; the labrum is testaceous, maxillae mostly luteous, mandibles and ocellae rufous, compound eyes black. The thorax is mostly black, with the following

parts of the mesothorax yellow; scutellum, caudal region of the prescutum, area bordering the convergent sutures, small caudo-lateral region of the scutum, and two large spots on the basisternum. The legs are black, with distal end of coxa and femur, and proximal end of tibia and tarsal joints yellow. The wings are hyaline, veins brown to black; stigma yellow, entirely margined with brown, an important character which separates this species from *D. virens* (Kl), the stigma of which is lighter, and only partially margined with brown; the abdomen is black with proximal margins of sterna, of terga 3-9 and distal end of dorsal valvulae, yellow.

*Structural characters—exoskeleton of the head*—The head is hypognathous, somewhat flattened or concave behind and convex in front. The surface is sericeous and punctate; the punctures are numerous and deep, except on the genae and between the antennal foveae. The epicranial and occipital sutures are absent, and the cranial area includes the clypeus, the fronto-parietals, and the postocciput.

The clypeus is a transverse sclerite, separated from the fronto-parietals by the epistomal suture (Fig. 1, es). The clypeal suture divides the clypeus into a proximal postclypeus (Fig. 1, pcp) and a distal anteclypeus (Fig. 1, acp). The distal border of the anteclypeus is emarginate. The dorsal region of the fronto-parietals is divided by two lateral parietal sutures (Fig. 1, ps), which extend from the lateral ocelli to the dorsolateral angles of the postoccipital suture. A suture also extends transversely, terminating at the lateral ocelli. Ventrad of this suture lies the median ocellus. The genae bear the acetabula with which the condyles of the mandibles articulate (Fig. 1 and 2, al and alI). The anterior tentorial pits (Fig. 1, at) lie at either extremity of the epistomal suture. The compound eyes (Fig. 1, e) are widely separated. Each eye is surrounded by a narrow ocular sclerite (Fig. 1, os), which projects ventrally for a short distance into the genal region. The postocciput (Fig. 2, poc) is a narrow sclerite lying between the postoccipital suture and the neck membrane. The labrum (Fig. 8) is supported by a pair of large tormae, which are concealed by the clypeus. The inner surface of the labrum represents the epipharynx, the median area of which bears a group of sensory setae. The tentorium consists of three pairs of arms. The anterior arms (Fig. 10, at) originate from the dorso-lateral margin of the frontal plate and merge with the epicranium dorsad of the antennae. The posterior arms (Fig. 2 and 10, tb) fuse mesally to form a bridge which spans the foramen magnum between the posterior tentorial pits.

*Appendages of the head*—The antennae are longer than the head is wide. The scape and pedicel (Fig. 3, scp and pe) are subcylindrical. The flagellum is serrate and tapers towards the distal end. The number of segments in the antennae varies from 20 to 22. The mandibles (Fig. 4 and 5) are dicondylar, asymmetrical, heavily sclerotized appendages. They are thickened proximally and compressed distally, bearing scattered setae on the convex surface. A molar surface is absent, but the incisor edge is strongly developed, consisting of three denticles. The distal dens of the left mandible is longer than that of the right, and is used in cutting the emergence hole in the cocoon. The maxillae and labium are united, and the composite structure is suspended from the postgenae by means of a membranous attachment with the maxillary cardines. Each maxilla consists

of a triangular cardo (Fig. 9, cd) and an elongate stipes (Fig. 9, st). The stipes bears a six-segmented palpus (Fig. 9, mxplp), a galea, and a lacinia (Fig. 9, ga & lc). The labium consists of a sclerotized prementum (Fig. 2, prmt) and a membranous postmentum (Fig. 2, ppmt), which contains a small oval sclerite, the submentum (Fig. 2, smt). The labial palpi (Fig. 2, lbplp) consist of four segments. The prementum bears three lobes, two lateral paraglossae (Fig. 2, pgl), and a median lobe, which represents the fused glossae (Fig. 2, gl). A group of circular sensoria are present on the inner surfaces of the glossae and paraglossae. The dorsal surface of the labium bears the hypopharynx (Fig. 7, hphy), which lies between the sclerotized plates of the prementum.

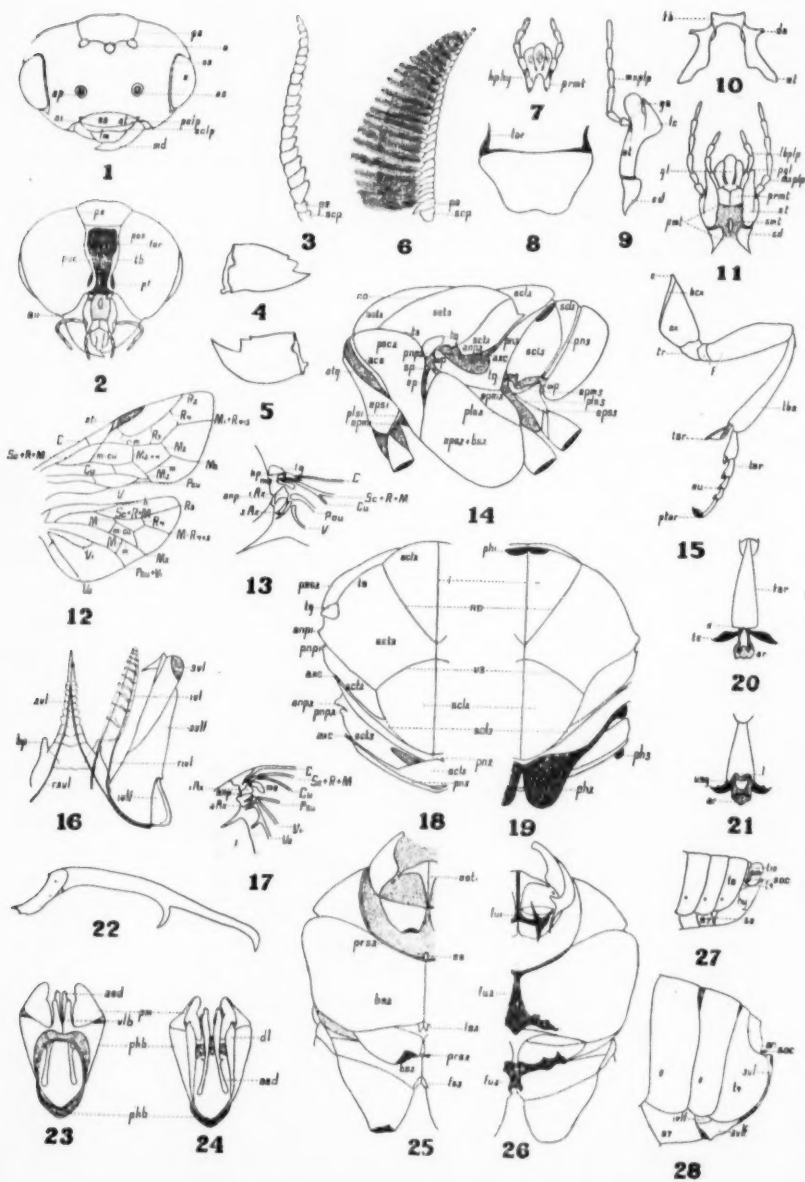
*The cervical membrane*—The cervical membrane is entirely membranous, but is supported ventrally by the arms of the episterna of the prothorax.

*The exoskeleton of the thorax: The dorsum* of the thorax is entirely sclerotized, and each of the pterothoracic terga is occupied by two plates, the alinotum and the postnotum. The alinotum of the mesothorax consists of the acrotergite, prescutum, scutum, and scutellum. The acrotergite (Fig. 14, atg), is a narrow sclerite, separated from the prescutum by a submarginal antecostal suture (Fig. 14, acs). Internally this suture is marked by a pair of phragmatal lobes (Fig. 19, ph-1). The prescutum is narrow dorsally, widening laterally; it is marked caudally by a deep depression bearing the prescutal suture (Fig. 14 and 18, ts). The scutum of the mesothoracic alinotum (Fig. 18, sct2) is divided by several grooves and sutures. A pair of notaulices, or convergent sutures (Fig. 18 and 19, no), arise laterally and converge caudally towards the median notal suture (Fig. 18, i). The scutum is separated from the scutellum by the scutoscutellar suture (Fig. 14 and 18, vs). A pair of lateral ridges originate at the scutoscutellar suture and diverge forward as far as the anterior notal wing process (Fig. 14 and 18, anpl). The part of the scutum lying laterad of these ridges is strongly concave, and bears the posterior notal wing process (Fig. 18, pnp). The scutellum (Fig. 18, sct12) extends caudolaterally to join the axillary cord of the mesothoracic wing. The alinotum of the metathorax includes two regions, the scutum and scutellum. The scutum (Fig. 14 and 18, sct3) is deeply concave caudally, and two membranous areas occur near the cephalic margin. The scutellum (Fig. 14 and 18, sct13) is coarsely punctate, a condition which is characteristic of the *Diprion* genus.

The mesothoracic postnotum consists of a single glabrous sclerite (Fig. 14 and 18, pn2). It merges laterally with the dorsal portion of the mesoepimeron, which is cut off from the remainder of the epimeron by a longitudinal suture. The mesopostnotum bears two large phragmatal lobes mesally, and a smaller pair of lobes laterally (Fig. 19, ph2).

The metapostnotum (Fig. 14 and 18, pn3) is a narrow sclerite, concealed by the overlapping first abdominal notum. The phragmata of the metapostnotum are represented by a pair of small lobes (Fig. 19, ph3).

*The pleuron*—The pleural suture divides each of the thoracic pleura into a large, cephalic episternum, and a small caudal epimeron. The prothoracic episterna project forward and terminate near the posterior tentorial pits. The mesoepisternum (Fig. 14, eps2) merges with the mesobasisternum. The epimeron



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*D. pinnatus* is by far the most common local The

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of the mesothorax (Fig. 14, epm2) is divided by a suture, and the dorsal part merges with the mesothoracic postnotum. A small sclerite, which lies between the mesoprescutum and the episternum of the mesothorax (Fig. 14, ep) probably represents an epipleurite. A small sclerite, the tegula (Fig. 14, tg), occurs dorsad of each wing process (Fig. 14, wn). The meso- and metathoracic spiracles (Fig. 14, sp) lie in the pleural membrane.

*The sternum*—The prothoracic sternum includes a cephalic eusternum (Fig. 25, est1), a small caudal spinasternum (Fig. 25, ss), and two small precoxal sclerites which lie in the sternal membrane. Each of the pterothoracic sterna consists of the presternum, basisternum, and furcasternum. The presternum (Fig. 25, prs) is a narrow, submarginal sclerite, separated from the basisternum by the presternal suture. The basisterna (Fig. 25, bs2 and bs3), furcasterna (Fig. 25, fs2 and fs3), and the prothoracic eusternum are divided by a median sternal suture. The prothoracic furcae (Fig. 26, fu1) originate at the caudal end of the sternum, and extend forward the full length of the eusternum. The pterothoracic furcae (Fig. 26, fu2 and fu3) arise from the furcasterna.

*The appendages of the thorax: The wings*—The wing venation shows no specific characters, and the nomenclature of the veins and axillary sclerites is given in figures 12, 13 and 17.

*The legs*—The coxa (Fig. 15, cx) is subconical, and has a single articular surface with the pleuron. A suture encircling the proximal end of the coxa sets off a submarginal region, the basicoxite (Fig. 15, bcx). The femur (Fig. 15, f) is girdled at the proximal end by a secondary suture, giving the trochanter (Fig. 15, tr) a two-segmented appearance. The tibia bears two distal spurs of unequal length. One of these spurs of the metathoracic leg is equipped with a leaf-like flap, which is characteristic of only three other known species of *Diprion*, namely, *D. pallidus* (Kl), *D. fennicus* (Forsius), *D. virens* (Kl). The tarsus is five-segmented. The ventral surface is sericeous, and each segment supports an euplantula (Fig. 15, eu). The pretarsus includes a pair of claws and an arolium. Each claw (Fig. 20 and 21, tc) has a distal and subapical tooth, which is typical of the *Diprion* genus with the exception of at least two species, *D. pallipes* (Fall) and *D. fuscipennis* (Forsius). The arolium (Fig. 20 and 21, ar) is a median process, of which the distal end is a membranous lobe, supported on a sclerotized ring. The ventral surface of the arolium contains three sclerites, a large, median unguitractor (Fig. 21, ung), and two small auxiliary plates (Fig. 21, i).

*The exoskeleton of the abdomen*—Ten abdominal segments are present in *D. polytomum*. The terga are finely striated. The first tergum is deeply emarginate caudally, and the proctiger, or tenth tergum, is greatly reduced. The anus is borne in the membranous area which lies between the proctiger and the genital parts. The first, eighth and ninth sterna are membranous. The gonopore is located in an infolded membrane which is concealed by the seventh sternum. The spiracles are located on the terga of the first eight abdominal segments.

*The genitalia*—The first or ventral valvulae (Fig. 16, Iv1) are connected with the first valvifers by means of long, curved rami (Fig. 16, rIv1). The arma-

ture on the outer surface of the first valvulae consists of teeth, which usually occur in eleven rows, though twelve rows are sometimes present. The teeth are largest on the second, third, and fourth rows. The number of teeth on each row is variable. The first valvifers (Fig. 16 and 28, 1vlf) are small, triangular sclerites lying ventrad of, and partly concealed by the ninth tergum. The first valvifer has articular surfaces with the ninth tergum and with the second valvifer. The second or inner valvulae (Fig. 16, 2v1) are joined mesally, except at the distal end. The irregular, toothed margins give the valvulae a segmented appearance. At the base of each second valvula there is a small caudally projecting process (Fig. 16, bp). This process is present in all of the common European species of *Diprion*, but the writer has not seen it in any species of *Neodiprion*, including the European *Neodiprion sertifer*. The shape of this process appears to be constant for each species of *Diprion*. The process on the second valvulae functions as a guide for holding the ovipositor in position while the incision in the host needle is being made. A pair of rami (Fig. 16, r2v1) connect the second valvulae with the second valvifers. The rami of the two pairs of valvulae are fitted so that the first valvulae may slide backward or forward on the second valvulae. The second valvifers (Fig. 16 and 28, 2vlf) are elongate sclerites, each of which articulates with its corresponding valvula. The ninth tergum and the dorsal valvulae have a membranous attachment with the second valvifers. The third, or dorsal valvulae (Fig. 16 and 28, 3v1) adjoin mesally, forming what some writers call the saw-sheath. The valvula consists of a membranous lobe supported on a triangular sclerite.

*The socii*.—*The socii* (Fig. 28, soc) are paired appendages located on the distal edge of the proctiger. They are small, club-shaped structures, covered with long setae.

*Male*.—*Size*.—The males are smaller than the females, measuring 6.5 mm., with a range of 4 to 8.5 mm.

*Colour characters*.—The head is piceous with labrum, preclypeus, and sometimes postclypeus whitish. The antennae and compound eyes are black, ocelli reddish. The mandibles are blackish proximally, rufous distally. maxillae and labium luteus to whitish. The thorax is testaceous, with the tegulae entirely, and the lateral regions of the mesothoracic prescutum mostly yellowish to white. The degree of white on the latter is variable. The legs are reddish yellow, with the distal end of the hind tibiae ferruginous, and the proximal two-thirds of coxae blackish. The wings are hyaline proximally, smoky distally; wing veins and stigma brown. The abdomen is black dorsally, with triangular areas of reddish brown laterally on each tergum. The abdominal sternum and hypopygium are reddish brown, usually the proximal three or four sterna darker than the others. Males of *D. polytomum* are readily distinguished from two other *Diprion* species which are known to occur in Canada, *D. simile* and *D. frutetorum*, these lacking the whitish colouration of the labrum and clypeus, and the yellow colouration of the prescutum. *D. polytomum* males also resemble the European *D. virens* and *D. abieticola* (D.T.), but the prescutum of *D. virens* is more black than yellow, and the stigma of both *D. virens* and *D. abieticola* is much lighter in colour.



*Structural characters*.—The anatomy of the male is similar to that of the female, and will be discussed only in so far as striking differences occur. The antennae (Fig. 6) are plumose, and the number of antennal segments varies from 23 to 26. It was mentioned previously that one of the two tibial spurs of the female metathoracic leg is equipped with a leaf-like flap. This structure is absent on the male. The abdomen of the male consists of ten segments. The first eight terga are similar to those of the female, and bear spiracles laterally. The ninth and tenth terga (Fig. 27, t9 and t10) are greatly reduced, and are represented by two narrow sclerites which are sometimes concealed by the overlapping eighth tergum. The tenth tergum bears a pair of small socii on the distal margin. The sternum of the first abdominal segment is membranous, while the succeeding six segments are similar to those of the female. The eighth sternum (Fig. 27, s8) consists of two lateral sclerites. The ninth sternum, or hypandrium (Fig. 27, hy) is the largest of the abdominal sterna, and it conceals the ventral region of the genital chamber. The tenth sternum is apparently missing. The genitalia consist of a two-segmented phallobase, a pair of parameres, a pair of dorsal lobes, a pair of ventral lobes and the aedeagus. The proximal segment of the phallobase (Fig. 24, phb) is a narrow, heavily sclerotized ring having a membranous attachment with the larger distal segment. The distal segment of the phallobase bears the ventral lobes (Fig. 23, vlb), which lie near the median line and are separated only by a suture proximally. The dorsal lobes (Fig. 24, dl) are rigidly attached to the phallobase, and the distal end of each lobe is bifurcate. The parameres (Fig. 23 and 24, pm) are a pair of triangular, moveable appendages, attached to the distal margin of the second segment of the phallobase. The aedeagus (Fig. 22 and 24, aed) is supported laterally by a pair of elongate rods. These are heavily sclerotized proximally, and the outer surface of the free end bears an irregular row of spines. Muscular attachment is partly effected by means of two lateral projections on the sclerotized portions of the aedeagus. The shape of the aedeagus is quite different from that of at least five other species of *Diprion* examined by the writer, and it appears to be an important specific character.

#### ACKNOWLEDGEMENTS

The writer is indebted to several officers of the Entomological Branch for their assistance in the preparation of this paper. To Messrs. J. J. de Gryse, R. E. Balch, A. B. Baird, and G. S. Walley, thanks are extended for criticisms and suggestions. Mr. L. Roy Finlayson supplied specimens of several exotic species of *Diprion*, Dr. O. Peck kindly provided references of European literature and Mr. M. L. Prebble furnished valuable information on the nomenclature of some morphological structures.

#### REFERENCES

- (1) Balch, R. E. 1937, The Spruce Sawfly Outbreak in 1936, Pulp and Paper Magazine of Canada, Feb. 1937.
- (2) Enslin, E. 1917, Die Tenthredinoidea Mitteleuropas, supplement to Deut. Ent. Zeit 12: 541-563.
- (3) Hartig, T. 1834, Der Entomologische Teil in dem forstlichen und forst-naturwissenschaftlichen Conversations-Lexicon: 991. Nauch, Berlin.
- (4) Rohwer, S. A. 1918, New Sawflies of the Sub-family Diprioninae (Hym) Proc. Ent. Soc. Wash. 20:79-90.
- (5) Snodgrass, R. E. 1935, Principles of Insect Morphology, McGraw-Hill, New York.

## EXPLANATION OF PLATE 15

1—Cephalic view of female head, 2—Caudal view of female head, 3—Female antenna, 4—Right mandible of female, 5—Left mandible of female, 6—Male antenna, 7—Inner surface of female labium showing hypopharynx, 8—Labium of female, 9—First maxilla of female, 10—Tentorium of female, 11—First maxilla and labium of female, 12—Wings of female, 13—Base of fore wing of female, 14—Thorax of female, 15—Metathoracic leg of female, 16—Genitalia of female, 17—Base of hind wing of female, 18—Thoracic tergum of female—ectal surface, 19—Thoracic tergum of female—ental surface, 20—Pretarsus of female leg—outer surface, 21—Pretarsus of female leg—inner surface, 22—Aedeagus of female—half, 23—Genitalia of male—ventral surface, 24—Genitalia of male—dorsal view, 25—Thoracic sternum—ectal surface, 26—Thoracic sternum—ental surface, 27—Distal end of male abdomen, 28—Distal end of female abdomen.

## LIST OF ABBREVIATIONS

a—mandibular condyle, acp—anteclypeus, acs—antecostal suture, aed—aeedeagus, an—anus, anp—anterior notal wing process, ap—antennal pivot, ar—arolium, as—antennal sclerite, at—anterior arm of tentorium, atg—acrotergite, ax—axillaries, arc—axillary cord, bex—basicoxa, bp—process of 2nd valvula, bs—basisternum, c—point of articulation, C—costa, cd—cardo, Cu—cubitus, cx—coxa, da—dorsal arm of tentorium, dl—dorsal lobe, e—compound eye, ep—epipleurite, epm—epimeron, eps—episternum, es—epistomal suture, est—eusternum, eu—euplantula, f—femur, for—foram magnum, fs—furcasternum, fu—furca, ga—galea, gl—glossa, h—hamuli, hp—humeral plate, hphy—hypopharynx, hy—hypandrium, i—median notal suture, k—unguifer, l—trans scutal suture, lbpl—labial palpus, lm—labrum, M—media, m—media cross vein, m-cu—medio-cubital cross vein, md—mandible, me—median plate, mxplp—maxillary palpus, no—convergent suture, o—ocellus, os—occipital sclerite, par—parapsidal suture, pclp—postclypeus, Pc—postcubitus, pe—pedicel, pgl—paraglossa, ph—phragma, phb—phallobase, pls—pleural suture, pm—paramere, pmt—postmentum, pn—postnotum, pnp—postnotal wing process, poc—postociput, pos—postoccipital suture, prmt—prementum, prs—presternum, ps—parietal suture, psc—prescutum, ptar—pretarsus, pt—posterior tentorial pit, R—radius, r m—radio-medial cross vein, rvl—ramus of 1st valvula, r2vl—ramus of 2nd valvula, s—sternum, Sc—subcosta, scl—scutellum, scp—scape, set—scutum, smt—submentum, soc—socius, sp—spiracle, ss—spinasternum, st—stipes, sti—stigma, t—tergum, tar—tarsus, tb—tentorial bridge, tba—tibia, tc—tarsal, tg—tegula, tor—torma, tr—trochanter, ts—transverse prescutal suture, tsr—tibial spur, ung—unguigractor, V—venal vein, vl—valvula, vlb—ventral lobe, vl?—valvifer, vs—scutoscutellar suture, wp—wing process.

## A NEW SPECIES OF PHILOPTERUS (MALLOPHAGA) FROM THE LONG-BILLED CURLEW.

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The species description presented is based on specimens taken by E. R. Tinkham from the long-billed curlew (*Numenius americanus* Wils.) collected at Presidio, Texas, May 26, 1929. The specimens are a part of the University of Minnesota collection which has been loaned to the writer for study and identification during the past few years. I am deeply indebted to Prof. C. E. Mickel for his kindness in regard to the loans from the Minnesota collections.

Osborn in 1896 reported *Philopterus testudinarius* (Denny) from *Numenius americanus*. In a recent exchange of specimens with G. B. Thompson of the British Museum of Natural History, the writer received two males of *P. testudinarius* from the type host *Numenius arquatus* (Linn.). A careful comparison of the dissected male genitalia shows that, while the specimens from *Numenius americanus* Wils. closely resemble *Philopterus testudinarius* (Denny), they should be recognized as belonging to a distinct species.

***Philopterus (Cummingsiella) longirostricola* sp. nov.**

*Female* Fig. 1. Body form, proportions and chaetotaxy are best described by the figure, the outline of which is a tracing of a microprojection of the holotype. The length of the head of the specimen is .897 mm. and its width is



.850 mm. With these measurements the dimensions of any structure may be computed from the figure.

The following head measurements from specimens picked at random are an indication of the size and variability of this form.

Head length	.874	.937	.920	.874	.860	.910	.920	.963	.924	.924
Head width	.858	.874	.874	.831	.831	.884	.871	.911	.858	.897

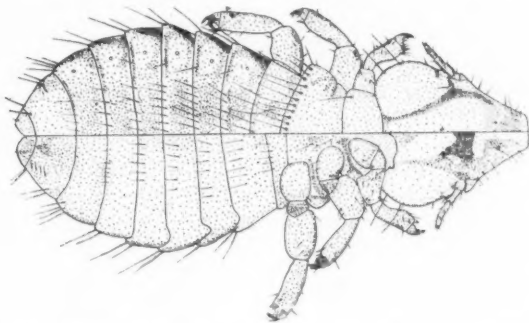


Figure 1. Female of *Philopterus longirostricola* sp. nov. 78X. The upper side shows the dorsal surface and the lower the ventral surface.

*Male.* The male although smaller, resembles the female closely in body proportions and chaetotaxy. Ventral median blotches, over one half the width of the segment in which they are located, are conspicuous on segments 2-6 inclusive. Such blotches are not noticeable in the female. The terminal segment of the abdomen is broadly and evenly rounded. The penultimate segment has a shorter lateral margin than does any one of the other abdominal segments.

The following head measurements of males give an indication of size and variability.

Head length	.850	.858	.821	.884	.841	.858	.818	.851	.831	.831
Head width	.818	.818	.818	.821	.805	.818	.792	.818	.818	.805

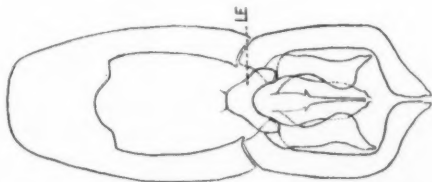


Figure 2. Ventral view of the male genitalia. 150X. LE is the lower endomere.

*Male Genitalia* Fig. 2. Differs from the copulatory apparatus of *P. testudinarius* in the absence of the median splint and the presence of two lateral barbs on the penis. The posterior tips of the lower endomere are bluntly rounded whereas the lower endomere of *P. testudinarius*, not clearly shown by Cummings 1916, is crescent shaped with the posterior tips acutely pointed. The penis of *testudinarius* tapers evenly whereas in *longirostricola* the penis narrows abruptly posterior to the barbs.

The nomenclature used in describing the male genitalia is, for the sake of ready comparison, that used by Cummings 1916 in describing the genitalia of *P. testudinarius*.

Holotype and allotype and seventeen paratypes have been deposited in the University of Minnesota collection.

It is the opinion of the writer that type specimens should be distributed as widely as the number of specimens permits so that they will be as available as possible to present and future taxonomic workers. Thus the seventeen paratypes allotted to the writer are deposited in the following entomological collections.

United States National Museum, Washington, D. C.; Canadian National Collection, Ottawa Can.; British Museum of Natural History, London; Stanford University, California; Tulane University of Louisiana, New Orleans, Herbert Osborn, Columbus, Ohio; G. A. H. Bedford, Onderstepoort, Union of South Africa. The remaining paratypes are in the Cornell University collection.

#### REFERENCES

- Cummings, B. F. 1916. Studies on the Anoplura and Mallophaga. Proc. Zool. Soc. London pp. 643-693.  
Osborn, H. 1896. Insects affecting domestic animals. U. S. Dept. of Agr. Bull. No. 5, New Series.

### MYIASIS IN THE FOOT OF A RAT BY *WOHLFAHRTIA MEIGENII* SCHINER. (DIPTERA, METOPIIDAE).

BY F. O. MORRISON,

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Cases of human myiasis have been recorded, on various occasions, from a number of widely scattered localities in Alberta. In several instances the causative larvae have been placed in alcohol and sent to this department for identification.

Unfortunately, with two exceptions, these were all in the first instar and were, therefore, too immature for this to be possible.

In 1933, a second instar larva, taken from the head of an Indian girl in an Edmonton hospital, was forwarded to Dr. E. M. Walker at Toronto University. He suggested that it might be *Wohlfahrtia meigenii* Schin. Again, in January 1934, a first instar larva was received from a child at Claresholm. The clinical history of the case had been as follows. The right knee was observed to be swollen. This subsided in a few days, when another swelling appeared in the region of the mid-thigh. On the following day a similar swelling was observed in the lumbar region. At this time a doctor was called in to examine the case. He did not observe further symptoms at the sites of the swellings but found the temperature to be 99.30. The swellings had subsided by the following day but a new one, which appeared to be more inflamed, had appeared on the right lower chest. A small vesicle could be seen in its centre. On the following day the vesicle had opened and the mother removed a single larva from it. The final phase of this case appears to be very similar to those recorded by Walker (8). We can only suggest that the earlier swellings might have been due to the

activities of larvae which failed to penetrate the skin though they irritated the tissues with their saliva.

A case, which appears to have been somewhat similar, occurred in July, 1937. We received for identification four larvae which had been taken from the flesh of a three month old baby, but were unable to obtain further information regarding the case.

A somewhat different type of myiasis occurred in the autumn of 1935, when about thirty dipterous larvae were removed from the ear of a woman in an Edmonton hospital. This woman had been working, during the previous afternoon, in a field. She thinks that she had noticed a fly buzzing persistently about her ear at about 3 p.m. During the night she experienced severe pain in the ear and was immediately brought to Edmonton by a neighbor. By 7 a.m. the larvae had been removed, but it was feared that the ear-drum was already destroyed. This, fortunately, proved to be incorrect. When the severe inflammation subsided, in a few days' time, her hearing was found to be unimpaired, though the canal was distorted. The larvae were extracted alive and were reared on raw beef at room temperature. An unidentified adult of the genus *Sarco-phaga* was obtained.

Several similar cases of aural or nasal myiasis in adults have been brought to our attention from different parts of Alberta.

On July 5, 1937, Mr. T. Karagosky, a medical student at the University, who was raising some locally bred rats, brought to the laboratory one which had a calyptate larva buried in its left hind foot. He had first noticed this larva on July 3, and considered that it had about doubled its size during the following two days. The infested foot was much swollen and the larva could be seen at intervals backing part way out of an open hole in the skin of the outer side of the foot.

The rat was placed in a wire screen cage over some damp sand. It fed normally, but did not use the infested foot.

On July 6 the larva had entered more deeply and no longer came to the surface. The wound bled perceptibly. The following morning there was a second large opening in the skin on the opposite, or inner, side of the foot. Both openings appeared to be closed just under the surface with skin-like membranes.

The mature larva, which had already emerged, was found under the surface of the sand. It was transferred to the surface of damp sand in a rearing jar, where it immediately re-buried itself. The rat remained active and continued to feed normally although the foot was still inflamed and swollen. Later it regained complete use of its foot.

Between Saturday evening (July 24) and Monday morning (July 26), about twenty days after the emergence of the larva from the wound, a large metopiid fly appeared in the breeding jar. The specimen was determined by the writer as *Wohlfahrtia meigenii* Schin. Aldrich's key and descriptions, together with material collected in southern Alberta, (our determination of which had been confirmed by C. H. Curran) were used in making this determination. The specimen was darker than the collected ones, but was not dark enough to answer the description of *W. vigil* Walk., which, up to the present is known to occur only in eastern Canada. It might almost be considered to be an intermediate form

between these two forms of which Aldrich (1) says, "*vigil* antedates *meigenii* by thirteen years . . . , and would replace the latter if it were ever shown that they are one species."

*W. meigenii* has never been taken as far north as Edmonton, but typical specimens have been captured on the blossoms of Goldenrod and Sweet Clover at Lethbridge.

*Wohlfahrtia magnifica* Schin. (European), and *W. vigil* Walk. (American) are recognized producers of myiasis in man and animals. (Matheson, 4). Patton and Evans (5) record the former as a specific, and the latter as an accidental myiasis producer.

Dove (2), attributes many cases of "nodular or pustular lesions" in man to *vigil*, but adds that "those occurring in the western portion of the United States . . . are probably due to a closely related species *W. meigenii* Schiner."

Among the most important studies on eastern *W. vigil* are those of E. M. Walker and Norma Ford. The former (7) describes two cases of myiasis in babies due to *W. vigil*. In 1922 the same author (8) describes an additional case and notes the peculiar habit of the larvae of penetrating the skin rather than entering by natural or accidental openings, as does the larva of *W. magnifica*. This habit seems to be inconsistent with the supposedly "accidental" nature of animal parasitism by this fly. In 1931 (9) he records eight additional cases of myiasis by *vigil* in Canada, one occurred as far west as Winnipeg. The flies he states occur from New England to Alaska.

In the same paper Walker refers to the very rapid development of larvae in the host and mentions eighteen days as the period of pupation.

Ford has observed and bred many individuals of *vigil*. In one publication (3), she mentions the habit of the larva of filling the small opening in the lesion in the host with the posterior end of its body. This habit was observed in the case of the larva of *W. meigenii* at Edmonton. Later (4) she points out that *vigil* adults avoid carrion but feed on the nectar of various plants including Goldenrod and Sweet Clover.

In the same publication this author refers to a peculiar association of the adults with water and railway grades. Professor E. H. Strickland, who collected the adults of *W. meigenii* at Lethbridge, informs the author that he could find them only on the flowers of Goldenrod and Sweet Clover which were growing on the banks of irrigation ditches, and that they appeared to be confined to these locations during two different years.

Although all specimens of *Wohlfahrtia* which have been taken in Western Canada have been identified as the Euro-Asian species *meigenii*, it will be noted that the rate of development and the habits of the larvae, in so far as they have been observed, as well as the habits of the adults are very similar to those of *vigil*. Patton and Evans (6) state that *meigenii* of Europe is a carrion breeder as opposed to the myiasis producing *magnifica* of that continent. This suggests that the true *meigenii* does not occur in Western Canada, but that our flies are rather a geographical variety of the eastern *vigil*.

## REFERENCES

1. Aldrich, J. M. *Sarcophaga* and Allies, Thomas Say Foundation 1916.
2. Dove, W. E., Myiasis of Man. Jour. Econ. Ent. Vol. 30, 1937.
3. Ford, N., Obs. on the Behav. of *Sarcoph. Fly W. vigil* Walk. Jour. Paras. Vol. 19, 1932.
4. Ford, N., Further Obs. on the Behav. of *W. vigil* Walk. with notes on collecting and rearing the Flies. Jour. Paras. Vol. 22, 1936.
5. Matheson, R., Medical Entomology, C. C. Thomas 1932.
6. Patton & Evans. Insects, Ticks, Mites and Venom. Animals. H. R. Grubb Ltd., Eng. 1929.
7. Walker, E. M. *W. vigil* as a Human Parasite. Jour. Paras. Vol. 7, 1920.
8. Walker, E. M. Some Cases of Cutan. Myiasis, with notes on larvae of *W. vigil* Wlk. Jour. Paras. Vol. 9, 1922.
9. Walker, E. M. Cutan. Myiasis in Can. Can. Pub. Health Jour. 1931.

## MACROSIPHUM APHIDS INFESTING CHRYSOTHAMNUS AND GUTIERREZIA<sup>1</sup>.

BY C. F. SMITH AND G. F. KNOWLTON,  
Logan, Utah.

The following report deals with species of *Macrosiphum* collected upon *Chrysothamnus* and *Gutierrezia* in Utah and nearby areas of the West.

### KEY TO SPECIES

- A. Body bearing fan-shaped hairs.
  - B. Cauda bearing 5 or more pairs of lateral hairs ..... *sporadicum*
  - BB. Cauda with fewer than 5 pairs of lateral hairs ..... *packi*
- AA. Body bearing blunt or knobbed hairs only.
  - B. Cauda with 5 or more pairs of lateral hairs.
    - C. Cornicles exceeding 4 times hind tarsi ..... *ambrosiae*
    - CC. Cornicles not distinctly exceeding 4 times hind tarsi  
..... *chrysanthemi*
  - BB. Cauda bearing fewer than 5 pairs of lateral hairs.
    - C. Antennal IV bearing sensoria ..... *zerogutierrezis* n. sp.
    - CC. Antennal IV without sensoria.
      - D. Cornicles not distinctly longer than four times length of tarsi ..... *glabrum*
      - DD. Cornicles more than 4 times hind tarsi *escalantii* (group)

### ***Macrosiphum chrysanthemi* (Oest.).**

Oestlund, Geol. and Nat. Hist. Surv. Minn. Bul. 4. p. 84, 1887 (*Nectarophora*).

*Collections*:—Alate only on *Chrysothamnus nauscosus* at Blacksmith Fork Canyon, September 2, 1926 (Knowlton).

### ***Macrosiphum escalantii* (Knl.) (Group)**

Knowlton, Pan-Pacific Entomologist 5:79, 1928 (*Tritogenaphis*).

*Alate vivipara*.—Color, apple green; body 1.09 to 2.35; antennae dark beyond base of III, 2.08 to 3.1 mm.; antennal III, 0.47 to 0.77 mm. long and bearing 20 to 38 sensoria scattered over entire joint; IV, 0.4 to 0.63; V, 0.36 to 0.55; VI, 0.1 to 0.16 + 0.6 to 0.8; rostrum surpassing 2nd coxae; rostral IV + V, 0.14 to 0.157; hind tibiae 1.27 to 1.88; hind tarsi 0.14 to 0.157; cornicles dusky to dark, 0.61 to 1.02 mm. long, 0.2 to 0.3 mm. of the distal and reticulated; cauda dusky, entire length 0.25 to 0.4, hard portion 0.22 to 0.31 mm., bearing 3 to 4 pairs of lateral hairs and 1 or 2 dorsal hairs.

<sup>1</sup>Contribution from the Departments of Entomology, Utah Agricultural Experiment Station and Ohio State University. Authorized for publication, September 1937.

*Apterous vivipara*.—Color apple-green, body 1.6 to 2.6; antennae dusky black beyond base of III, 2.1 to 2.74 mm.; antennal III, 0.5 to 0.8 mm. long and bearing 8 to 14 sensoria scattered over basal two thirds of joint; IV, 0.4 to 0.6; V, 0.3 to 0.5; VI, 0.1 to 0.14, (usually 0.125) + 0.6 to 1.2; rostrum attaining 3rd coxae; rostral IV + V, 0.125 to 0.14; hind tibiae 1.3 to 1.85; hind tarsi 0.125 to 0.15; cornicles dusky to dark except base, 0.66 to 1.2; cauda 0.2 to 0.3 for hard portion, 0.26 to 0.42 for entire length and bearing 3 or 4 pairs of lateral hairs and 2 to 3 dorsal hairs.

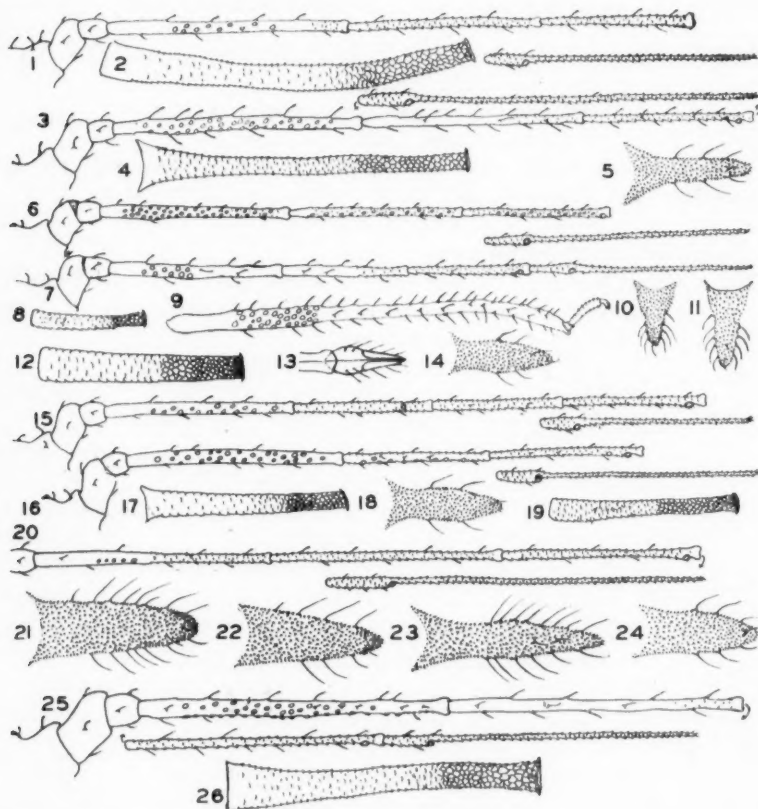


Fig 1. *Macrosiphum escalantii* (Knl.). Aptera, 1-2, Alate, 3-5. Male 6, 8, 10. Oviparous female, 7, 9, 11. *M. zerogutierrezis* n. sp. Aptera, 12-15. Alate, 16-18. *M. glabrum* G. and P. Aptera, 20, 24. *M. sporadicum* Knl. Aptera, 21. *M. packi* Knl. Aptera 22. *M. ambrosiae* (Thomas). Alate 23, 25-26.

*Apterous ovipara*.—Color reddish-green; body 1.8 to 2.; antennae 2.2 to 2.4; antennal III, 0.55 to 0.64 mm. long and bearing 10 to 18 sensoria: IV, 0.39 to 0.45; V, 0.38 to 0.43; VI, 0.11 to 0.13 + 0.5 to 0.65; rostrum attaining 3rd coxae; rostral IV + V, 0.14 to 0.16; hind tibiae 1.25 to 1.36 mm. long and bearing 35 to 45 sensoria; hind tarsi 0.14 to 0.15; cornicles dusky to dark, 0.75 to 0.85; cauda 0.23 to 0.4 mm. long.



*Alate males*.—Color reddish to reddish-green; body 1.8 to 2.; antennae 2.2 to 2.4 mm. long, dark beyond base of III; antennal III, 0.56 to 0.65, bearing 40 to 50 sensoria; IV, 0.48 to 0.53, and bearing 12 to 16 sensoria; V, 0.4 to 0.48 bearing 12 to 15 sensoria; VI, 0.094 to 0.11 + 0.55 to 0.7; rostral IV + V, 0.13 to 0.145; hind tibia 1.2 to 1.45; hind tarsi 0.14; cornicles 0.3 to 0.37; cauda 0.159 to 0.21 and bearing 3 to 4 pairs of lateral hairs.

*Taxonomy*.—All of the material placed in this "group" runs to *Macrosiphum katonkae* Hottes, in Gillette and Palmer's key (Ann. Ent. Soc. Amer. 27; 170). A study of approximately one thousand specimens, comprising about one hundred twenty-five separate collections, throughout Utah and southern Idaho, shows this to be a highly variable "species." This group may comprise more than one species, but if so, intergrading forms make their separation difficult. For the present the writers are placing *Macrosiphum utahensis* P. and K.), and *M. gutierrezia* (P. and K.), in the *M. escalantii* group. *M. katonkae* (Hottes) is a related but somewhat larger species.

*Collections*.—Localities from which this material has been collected upon *Chrysothamnus nauscosus* are: Amalga; Beaver Dam; Benson; Brigham; Brigham Canyon; Cedar Creek; Circleville, Collinston; Dewey; Hardup; Honeyville; Hooper, Kannaraville; Lark; Logan; Logan Canyon; Mill's Junction; Nephi; Newton, Oak City; Park Valley; Portage; and Smithfield, in Utah. Fort Bridger and Lyman, Wyoming, and Paris, Idaho. On *C. viscidiflorus* at Blacksmith Fork Canyon; Blue Flats; Boswell; Bryce Canyon; Cedar Creek; Cornish; Daniel's Canyon; Duchesne; Fort Duchesne; Glendale; Gooseberry; Orderville; Randlett; Trenton; Sawtooth; Smithfield; Uinta; 15 miles S. W. Woodruff; 5 mi. W. Vernal, in Utah; and Riverdale, Idaho. On *C. parryi* at Chester; Clear Creek Canyon; Elsinore; Huntsville; Kanab; and Marysvale, Utah. On *Chrysothamnus* sp. at Blue Bench; Huntington; Panguitch; Santa Clara; and Toquerville, Utah. On *Gutierrezia* at Beaver; Hyrum; Leeds and Virgin, Utah.

### ***Macrosiphum glabrum* G. & P.**

Gillette and Palmer, Ann Ent. Soc. Amer., 21:2, 1928.

*Apterous vivipara*.—Color shining green; body 1.96; antennae 3.14; antennal III, 0.7 mm., bearing 6 sensoria; IV, 0.69; V, 0.58; VI, 0.188 + 0.84; rostral IV + V, 0.14; hind tibiae, 0.85; hind tarsi, 0.157; cornicles 0.56, the distal 0.21 being reticulated; cauda 0.34 mm. long.

*Collections*.—Nioche, Utah, July 28, 1928 on *Chrysothamnus viscidiflorus* (Knowlton).

### ***Macrosiphum ambrosiae* (Thomas)**

Thomas, Illinois St. Lab. Nat. Hist., Bul. 2, p. 1877 (*Siphonophora*).

*Collections*.—Alate only taken upon *Chrysothamnus nauscosus* at Brigham Canyon, July 21, 1928 (Knowlton); Plain City, September 2, 1927 (Knowlton); Providence July 18, 1925 (Knowlton). In Utah; and at Preston, Idaho July 26, 1936 (Smith).

*Taxonomy*.—For the time being the writers are considering *Tritogenaphis koscaudis* Knlt.<sup>2</sup> to be the same as *Macrosiphum ambrosiae* (Thomas).

<sup>2</sup>Knowlton, Pan-Pacific Entomologist, 5:79, 1929.

**Macrosiphum packi** Kntl.

Knowlton, Pan-Pacific Entomologist 4:169, 1928.

*Collections*:—Taken upon *Chrysothamnus* at American Fork, July 11, 1936; Cedar City, August 9, 1936; Clover, April 30, 1936; Leeds, August 15, 1936; Levan, May 13, 1936; Mills, August 6, 1936; Mt. Carmel, August 8, 1936; Orderville, August 10, 1936; Spanish Fork, May 13, 1936; Stockton, April 29, 1936; Vernon, April 30, 1936, in Utah. Also at Beaver Dam, Arizona, April 25, 1935.

**Macrosiphum sporadicum** Kntl.

Knowlton, Pan-Pacific Entomologist 11:135, 1935.

*Collections*:—Taken upon *Chrysothamnus nauseosus* at Brigham, June 6, 1936; Butlerville, August 7, 1936; and Promontory, September 23, 1936.

**Macrosiphum zerogutierrezis** n. sp.

*Apterous vivipara*:—Color bright apple green; body 1.19 to 1.72 mm. long; hairs on vertex 0.02 to 0.032; hairs on abdomen 0.03 to 0.046; antennae black beyond base of III, and 1.75 to 2.2 mm. long; antennal III, 0.45 to 0.58 mm. long, bearing 13 to 24 sensoria; IV, 0.28 to 0.45 mm. and bearing 0 to 3 sensoria; V, 0.27 to 0.42; VI, 0.094 to 0.1 + 0.42 to 0.53; rostrum obtuse, surpassing 2nd coxae; rostral IV + V, 0.11 to 0.125; hind tibiae 1.02 to 1.25; hind tarsi 0.095 to 0.125; cornicles dusky to dark beyond base, 0.5 to 0.62 mm. long with 0.15 to 0.2 mm. of the distal portion reticulated; cauda 0.26 to 0.34 mm. long and bearing 2 (occasionally 3) pairs of lateral hairs and 1 to 3 dorsal hairs.

*Alate vivipara*:—Color apple green; body 1.5 to 3.05; antennae black beyond base of III, and 2.05 to 2.35 mm. long; antennal III, 0.51 to 0.61 mm. long and bearing 25 to 36 sensoria; IV, 0.44 mm. bearing 12 sensoria; V, 0.36 to 0.44 mm. bearing 0 to 2 sensoria; VI, 0.09 to 0.11 + 0.47 to 0.59; cornicles black, 0.39 to 0.54 mm. long with 0.2 to 0.22 mm. of the distal portion reticulated; cauda 0.25 to 0.33 mm. long.

*Taxonomy*:—This species differs from *Macrosiphum vescalantii* Kntl. and other species known to occur on *Chrysothamnus* and *Gutierrezia* in the alate and usually the aptera bearing sensoria on antennal IV.

*Collections*:—On *Gutierrezia* at American Fork, July 11, 1936. (Knowlton, Smith, M. W. Allen); Brigham, September 3, 1927 (Knowlton); Brigham Canyon, September 13 and October 11, 1927 (Knowlton); Emery, June 28, 1927 (Knowlton); Fort Duchesne, July 14, 1927; Fillmore, May 3, 1934 (Knowlton); Glendale, June 26, 1927 (Knowlton); Holden, June 1933; Hyrum, October 6, 1927 (Knowlton); Kanab, June 26, 1927 (Knowlton); Leeds, April 28, 1935 (Knowlton-Smith); Logan, September 10, 1927 (Knowlton); Salt Lake City, July 13, 1935 (Knowlton); Millville, October 6, 1927 (Knowlton); Roy, September 15, 1927 (Knowlton); Summit, August 9, 1936 (Knowlton: Smith); Sunset, September 2, 1927 (Knowlton); Thatcher, August 24, 1927 (Knowlton); Willard, September 15, 1927 (Knowlton).

## A NEW THRASSIS SPECIES (SIPHONAPTERA) FROM CALIFORNIA.

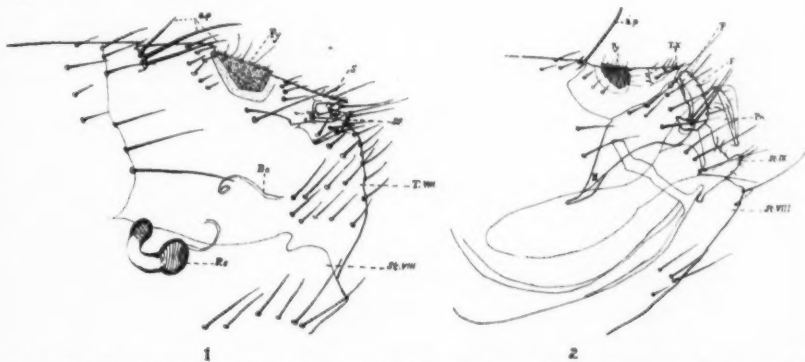
BY M. A. STEWART,

University of California, Davis, California.

***Thrassis desertorum* sp. n.**

♂ ♀.—*Thrassis desertorum* belongs to that section of the genus which is characterized by having metatarsal segment I equaling or slightly exceeding II. In this species metatarsal segment I equals II and III together. The labial palpi exceed the fore-trochantera. The lower genal row consists of 3 bristles; the upper bristle is located higher than the eye; the middle, and smallest, one is inserted closer to the upper than to the lower genal bristle. The bristles of the second antennal segment are longer than the club. There is 1 large median occipital bristle present. The eye is present and darkly pigmented. The metepisternum bears 2 bristles. The metepimerum bears 5 bristles which are arranged from the anterior portion posteriorly as follows: 2:2:1.

♀.—The upper genal row consists of but 1 bristle. The pronotal ctenidium is composed of about 18 spines. The hind femur bears a row of 8-10 bristles on its inner side. There are 3 antepygidial bristles on each side. The stylet is more than twice as long as broad at the base and bears 2 lateral and an apical bristle. The distal end of the tail of the receptaculum seminis is dilated and this portion as well as the head of the receptaculum seminis is darkened and has the appearance (in cleared specimens) of being striated (Fig. 1). The posterior margin of sternite VII is digitate latero-dorsally (Fig. 1). The substylar flap is not heavily bristled.



ap.—antepygidial bristle; Bc.—bursa copulatrix; F.—movable process or claspers; M.—manubrium; P.—immovable process of claspers; Pn.—penis; Py.—pygidium; Rs.—receptaculum seminis; S.—stylet; sf.—substylar flap; st. viii.—eighth sternite; st. ix.—ninth sternite; T. viii.—eighth tergite; T. x.—tenth tergite.

♂.—The upper genal row consists of 2 bristles—1 near the oral margin and a smaller one close to the antennal groove. The pronotal ctenidium is composed of about 16 spines. The hind femur bears a row of 7-8 bristles on its inner side. The movable finger of the claspers slightly exceeds the tip of the immovable process (Fig. 2); it is angulate at about the middle of the dorsal margin and convex on the ventral margin. The ventral margin of the finger bears 3 bristles—about equally spaced from one another—and 4 hairs. The apex of the finger is somewhat truncate. The manubrium is attenuated and upturned

at the tip. Sternite IX is without flat, pointed modified bristles near its base; it is small and lightly bristled at the tip (Fig. 2). Sternite VIII bears but 2 bristles.

Length.—♀ 2.44 mm.; ♂ 2.08 mm.

*Holotype*: ♀. Riverside County, California; December, 1935; collected by United States Public Health Service; host, *Ammospermophilus leucurus* leucurus Merriam.

*Allotype*: ♂.

*Paratopotypes*: 15 ♀, 10 ♂.

## A NEW SPECIES OF THE SUBGENUS KRIBIOXENUS (DIPTERA, CHIRONOMIDAE).

BY J. G. REMPEL.

Cornell University, Ithaca, N.Y.

This subgenus has a rather peculiar distribution, one species having been described from equatorial Africa and one from Europe. It is therefore of interest to record a new species from Ithaca, N.Y. The following key will serve to distinguish these species.

1. Yellow species; styles of hypopygium straight; appendage 1 (superior process) subfiliform and bare. Cameroon.

*pallidus* Keiffer. (Ann. ent. Soc. France 90: 53, 1921).

Species with green or brownish-black abdomen; styles of hypopygium curved or sinuate; appendage 1 lobed, pubescent . . . . . 2.

2. Abdomen green; postnotum yellow or reddish; L.R. 1.4. Belgium and England.

*brayi* Goetghebuer (Faune de France, 18:18, 1928; Trans. Ent. Soc. of London 77:396, 1919).

Abdomen brownish-black; postnotum dark brown; L.R. (♂) 1.25; Ithaca N.Y. *babiyi* n. sp.

### **Chironomus (Kribioxenus) babiyi** n. sp.

*Male*. Length 4 mm.

Head black, somewhat pruinose between the eyes; maxillary palpi 4-segmented, light brown; antennae 14-segmented, A. R. (i.e. ratio of apical segment to remainder of flagellum) 0.3; scape reddish with distinct pruinescence, flagellum brown.

Pronotum somewhat reduced, not visible from above. Mesonotum sordidly yellow; pectus dark brown; vittae light brown with distinct pruinescence between them; scutellum yellow. Metanotum dark brown.

Legs yellow, the front tarsi, except basal one-fourth of front metatarsi, apices of all tibiae, bases of front tibiae and apices of front femora, faintly infuscated. L. R. 1.25 (35:28), the relative lengths of front tibia and segments of tarsus being 28, 35, 20, 16, 12, 6. Front tibia with a distinct apical spine. Pulvilli absent.

Wings vitreous, bare;  $R_{2+3}$  ends slightly nearer to  $R_1$  than to  $R_{4+5}$ ; cubitus forks considerably beyond r-m. Squama unfringed. Halteres yellow with greenish knobs.

Abdomen brownish-black. Ninth tergite and sternite, and coxite black, basal appendages and styles pale yellow.

According to Edwards and Goetghebuer the coxite bears only two appendages, appendage 1 (superior) and appendage 2 (inferior). In the species described here a third outgrowth is found just anterior to the inferior process and at the same level. This might possibly represent what Edwards terms appendage 2a. The latter process is presented in the subgenus *Paratendipes* Kieffer to which this subgenus is obviously closely related.

*Female*. Resembles the male in color, but the basal abdominal segments have a greenish sheen and the front tarsus, as well as the entire front tibia, is more conspicuously infuscated. The antennae are brown, the scape somewhat yellowish. L.R. 1.45, the relative lengths of front tibia and segments of front tarsus being 25, 36, 18, 15, 10, 5.  $R_{2+3}$  joins costa half way between  $R_1$  and  $R_{4+5}$ .

This species is named in honor of Dr. P. P. Babi, assistant curator at Cornell University, who collected the type, as well as numerous other chironomid species, which he so kindly submitted to the writer for study.

*Holotype*.—♂, Ithaca, N. Y., May 22, 1937, at light, (Dr. P. P. Babi), Canadian National Collection No. 4265.

*Allotype*.—♀, same locality, June 11, 1937, (Dr. Babi), Canadian National Collection No. 4265.

*Paratypes*.—1 ♂, same locality, June 9, 1937, (Rempel), in Dr. O. A. Johannsen's collection; 1 ♂, same data as above paratype, in personal collection.

# THE MALES OF UROCERUS ALBICORNIS F. AND U. FLAVICORNIS F. (HYMENOPTERA: SIRICIDAE)\*

BY O. PECK.

Ottawa, Ont.

The females of these two species are markedly different in colour, yet the males resemble each other so closely that Bradley (1913) was unable to distinguish between them. Waterston (in Chrystal, 1928) separated the males by the proportions of the hind metatarsus; that of *U. albicornis* F. was "barely five times as long as broad," while in *U. flavicornis* F. the metatarsus was "nearly seven times as long as broad." However, Waterston had but two males of one species, and the metatarsal proportions vary intraspecifically; on this account, the value of the character cannot be determined without a long series.

To clarify this situation, the author studied the metatarsus in one hundred individuals taken from Nova Scotia, Quebec, Ontario, British Columbia and the North West Territory (Great Bear Lake). The specimens were easily divisible into two groups, many of them even by the naked eye. In 72% of the individuals the ratio of the length to the breadth varied from 4.1-5.6:1 while the remainder fluctuated from 6.4-8.1:1. As there were few extreme proportions within each group, it would seem that the shape of the metatarsus is sufficiently stable to separate the two species.

\*Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

## REFERENCES

Bradley, J. C. 1913. The Siricidae of North America. Jour. Ent. Zool. (Claremont, Calif.) 5: 1-30.

Chrystal, R. N. 1928. The Sirex wood-wasps and their importance in forestry. Bull. Ent. Res. 19: 219-224.

## BOOK NOTICES

A Glossary of Entomology. Smith's "Explanation of Terms Used in Entomology" completely revised and rewritten by J. R. de la Torre Bueno. Published by Brooklyn Entomological Society, Brooklyn, N. Y. Price \$5.00.

The publication committee of the Brooklyn Entomological Society and particularly the chief reviser are to be congratulated on the production of such a useful and comprehensive volume. Consisting of 336 pages it contains definitions of nearly 12,000 terms—as compared with the 4300 of Smith's Glossary—and covers not only the field of entomology proper but embraces the allied sciences, such as embryology, physiology, morphology, ecology, etc. In addition there are 9 Plates, illustrating structural details of various insect orders, which serve the very useful purpose of further elucidating a number of terms. In two Appendices we find a list of "Latin abbreviations" and Signs and Symbols used in Entomology." The work is indispensable to every entomological library.

Source Book of Biological Terms by A. L. Melander. Published by Department of Biology, College of the City of New York. Price \$1.10, with reductions for more than 5 copies.

This unique little book of 157 pages is published with the intention of assisting students of biology in acquiring a technical vocabulary and is based on material used in student's courses in the City College of New York. Part I, entitled "Discursive," treats in 26 short chapters, and in a more or less anecdotal way, of the derivation and evolution of biological nomenclature. Of particular interest are the chapters on "Pronunciation" and "Mispronunciations" and a careful perusal of these should do much to correct the woeful mispronunciations all too commonly met with on this continent, not only among younger students, but among many who certainly should know better. Part II contains an "Alphabetical List of the Components of Biological Vocabulary," giving derivations and accentuations of more than 4000 terms likely to be met with in courses in Zoology and Botany.

J. McDUNNOUGH.

## NEWS AND VIEWS

## RECENT DEATHS

It has been with very considerable regret that we have heard of the deaths of several prominent entomologists in the United States during the past few months.

Leon Howard Worthley, of Montclair, N. J., principal administrator of the division of Japanese control and Dutch elm disease eradication of the U. S. Federal Bureau of Entomology and Plant Quarantine, died on October 9th at Mountainside Hospital in Montclair after a six months' illness. Mr. Worthley was born in Skowhegan, Maine, in 1877.



Dr. Peter Walter Claassen, professor of Biology at Cornell University, Ithaca, N.Y., died on August 17th. Dr. Claassen was born in 1886.

Dr. Vernon Lyman Kellogg, permanent secretary of the United States National Research Council from 1920 until his retirement as secretary emeritus in 1932, previously professor of entomology at Stanford University, died on August 8th at the age of 69 years.

#### EUROPEAN TOUR

Professoor R. W. Lieby, of Cornell University, advises us that he and Dr. A. R. Shadle of the University of Buffalo, form a committee appointed by the Entomological Society of America and the American Association of Economic Entomologists to advertise the Seventh International Congress of Entomologists to be held in Berlin next summer. Special reduced steamship rates will be in effect for those booking under the committee's arrangements.

The following tour will be organized, if enough applications are received, for those wishing to tour Europe before, or after the Congress, or both. Sailing June 25th, six day motor coach tour through Ireland, one week motorcoach tour through England, nine days in London and northeastern England (Scotland optional) Norwegian fjords and glaciers, Oslo three to five days, Copenhagen, North Central Germany. After the Congress: Breslau, Krakau, Budapest, Vienna, the Danube, four days at an Austrian Alpine Lake, Munich, Switzerland, (Rigi, Lake Lucerne, Pilatus, Jungfrau) Paris. Sailing from Cherbourg September 18th.

Anyone interested in the tour may send in their name to the members of the committee and they will be kept informed. No general announcement will be mailed to the membership list.

#### REPORT OF THE MONTREAL BRANCH ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Sixty-four Annual Meeting of this Branch was held on May 15th, 1937, in the Lyman Entomological Room, McGill University, Montreal.

Eight meetings were held during the season—six in the Lyman Entomological Room and two in the Entomological Laboratory of the University of Montreal, with an average attendance of ten.

The following papers were read during the year:—

Presidential address—Aspects of Entomology to be studied	G. A. Moore
Collecting in South Africa	E. Munroe
Story of a colony of Yellow Jackets	F. R. Peden
Review of my captures in Hemiptera	G. A. Moore
Mimicry and melanism in butterflies and moths of South Africa	E. Munroe
Hemiptera taken at Laval des Rapides and Lanoraie	G. A. Moore
Progress in list of Hemiptera of the Province of Quebec	G. A. Moore
A glance at the Odonata	Father Fournier
Mites	Dr. A. Porter
Muscles of the head stomodeum of an Odonata nymph	
Ischura Verticalis	Mrs. E. G. Grieve

The following were elected officers for the coming year:—

President, H. A. U. Monro; Vice-President, G. Chagnon; Secretary-Treasurer, A. C. Sheppard; Council, G. A. Moore, J. W. Buckle and Dr. H. B. Fanthem.

THE SEVENTY-FOURTH ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY  
OF ONTARIO.

The 74th Annual meeting of the Entomological Society of Ontario was held in Toronto, at the Royal Ontario Museum, on November 18th and 19th, 1937. The president, Mr. L. S. McLaine, was in the chair. The following papers were presented: —

- "Bat Parasites"—J. R. Dymond.
- "Remarks on External Parasites of Canadian Wild Life"—Arthur Gibson.
- "Biology of the Plum and Peach Leafhopper," (*Macropsis trimaculata*)—Albert Hartzell.
- "A Study in Multiple Parasitism." The simultaneous P. opagation of *Ascoaster caropca*-*sae* Vier and *Macroncentrus ancylicvorus* Rohrer on the Oriental Fruit Moth (*Laspeyresia molesta* Busck.)—W. E. van Steenburgh and H. R. Boyce.
- "Life cycle of the Codling Moth in relation to temperature and humidity."—A. A. Beaulieu, Department of Agriculture, Quebec.
- "Controlling Codling Moth with Nicotine Bentonite"—James M. Merritt.
- "Laboratory Technique for Comparison of Contact Insecticides using *Drosophila* Flies,"—C. W. B. Maxwell and F. T. Lord.
- "Secondary Hosts of the Cornborer (preliminary list)—P. Lagloire.
- "The Causes of The Fluctuations in Cornborer Populations in Southwestern Ontario—G. M. Stirrett.
- "Notes on the European Corn Borer"—R. W. Thompson.
- "Experiments with Insecticides for the Control of the Corn Borer"—G. Gauthier and R. Mougeot.
- "Practical Value of Corn Topping for the control of the Corn Borer"—R. Mougeot and R. Desmarteau.
- "Some Results in Controlling the Onion Maggot (*Hydomyia antiqua* Meig.) with Calomel"—G. G. Dustan.
- "Experiments on the Control of the Cabbage Maggot"—R. Mougeot.
- "Controlling Pea Aphids with Vaporized Nicotine"—John Alsterlund.
- "Further Notes on Parasites of Aphids."—J. H. McLeod.
- "Unusual abundance of *Celerio lineata* in Ontario during summer of 1937"—Charles E. Corfe.
- "Observations on Insects and Entomology in Europe"—A. B. Baird.
- "Some Observations on the use of Methyl Bromide as a fumigant."—H. A. U. Monro.
- "The Potato Scab Gnat Outbreak in Middlesex County in 1937"—A. A. Wood.
- "The Insect Collection of Royal Ontario Museum of Zoology."—F. A. Urquhart.
- "An Outline of the Army Worm Outbreak in Canada in 1937."—H. G. Crawford.
- "Second Year Experiments on the Phototropism of June Beetles."—G. Gauthier.
- "A Preliminary Report on Oshawa—Niagara June Beetle Life History Zone."—G. H. Hammond.
- "Some Ecological Aspects of Host Resistance"—A. H. MacAndrews.
- "Spruce Sawfly Situation in Ontario."—C. E. Attwood.
- "Forest Insect Survey"—A. W. A. Brown.
- "Notes on the Occurrence of *Diprion fructorum* in Southern Ontario"—D. E. Gray.
- "The Importance of Cleanliness and Good Housekeeping Practices in Household Insect Control."—C. R. Twinn.
- "Some Notes on The Life History and Biology of the Flour Beetle"—*Tribolium destructor* Uytten"—H. E. Gray.
- "The Effects of Temperature and Certain Chemicals On Cheese Mites"—G. G. Dustan.
- "A Note On the Grasshopper Situation in Manitoba in 1937"—A. V. Mitchener.
- "Some Records of Captures in Light Traps"—F. C. Gilbiatt.
- "Experiments Relating to the Control of the Army Worm by Poisoned Baits"—A. Kelsall and H. T. Stultz.
- "Experiments in the Control of the Green Apple Bug and Apple Red Bug by means of Pyrethrum Sprays and Dusts"—N. A. Patterson.

Thursday evening, November 18th, an Entomological Dinner was held in Walker House. This was followed by an address by Professor P. J. Parrott, of the Geneva Experiment Station, U.S.A., on a recent trip of his to Africa, illustrated by several reels of motion pictures.

Dr. Arthur Gibson, Dominion Entomologist, Ottawa, was elected President for the coming year and the 75th Annual Meeting. Dr. Georges Maheux, Director of Plant Protection Service, Quebec, was elected Vice-President.

Mailed Friday, December 31st, 1937.

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# Index to Volume LXIX

*Achytonia* n. gen., 61.  
*Actias selene*, 138.  
*Aenoplex smithi* Pack., 115.  
*Agabus* congener Payk., 109.  
 " hypomelas Mann., 148.  
 " irregularis Mann., 149.  
 " lugens Lec., 148.  
 " nigripalpis Sahl., 109.  
 " pseudoconfertus Wallis., 149.  
 " semipunctatus Kby., 109.  
 " *vancouverensis* n. sp., 146.  
 " , with Notes on Other Species, A New North American, 146.  
*Agapostemon texanus subtilior* Ckll., 87.  
*Agelenid* Spiders, Notes on North American, 174.  
*Agrochola pistacina* Schiff., 46.  
 " *purpurea* Grt., 46.  
*Agyrtes longulus* Lec., 29.  
 " *similis* n. sp., 29.  
 AINSLIE, C. N., Articles by, 97, 255.  
*Aleptina inca* Dyar., 63.  
*Anarsia lineatella* Zell., 103.  
*Anarta cordigera* Thun., 42.  
 " *melanopa* Thun., 42.  
 " *myrtilli* Linn., 42.  
*Anathix* n. gen., 127.  
 " *puta* G. & R., 128.  
*Andrena* *apachecorum* Ckll., 35.  
 " *costillensis indecisa* n. subsp., 34.  
 " *costillensis* Vier. & Ckll., 35.  
 " *hirticincta* Prov., 35.  
 " *multiplicata* Ckll., 89.  
*Anisomorpha buprestoides* Stoll., 84.  
 " *ferruginea* P. de Beauv., 85.  
*Anisotoma amica* n. sp., 201.  
 " *basalis* Lec., 200.  
 " *blanchardi* Horn, 197.  
 " *confusa* Horn, 197.  
 " *discolor* Melsh., 202.  
 " *errans* n. sp., 202.  
 " *expolita* n. n., 199.  
 " *geminata* Horn, 196.  
 " *globososa* Hatch, 197.  
 " *inops* n. sp., 198.  
 " *interstitialis* Hatch, 197.  
 " *nevadensis* n. n., 199.  
 " *obsoleta* Horn, 201.  
 " , The North American Species of, 193.  
 Annual Meeting of the Entomological Society of Ontario, 210.  
*Anogdus capitatus* Lec., 170.  
 " Lec., 170.  
*Anomis impasta* Guenee, 219.  
*Anorthodes tarda* Gn., 62.  
*Antiplaga dela* Druce, 218.  
*Anthocoris musculus* Say, 146.  
*Apanteles cassianus*, 189.  
 " *etieffae*, 189.  
 " *monticola*, 189.  
 " *petrovae* n. sp., 189.  
 " *victoriae*, 189.  
*Apanteles gibsoni* n. sp., 152.  
 " *incorrupta* Hy. Edw., 152.  
*Apheloplastus egenus* Lec., 173.  
 " n. gen., 173.

Aphids from Massachusetts, Two New, 111.  
*Aphis aba* n. sp., 112.  
*Aseptis* n. gen., 59.  
*Aspidosoma ignitum* L., 30.  
*Astrapetis sutrina* Grt., 43.  
*Athyria ganglio* Hubner, 219.  
*Attalus smithi* n. sp., 91.  
*Autocara elliotti* Thomas, 120.

Baetina Mayflies with Particular Reference to the Nymphal Stages, Descriptions of Eastern North American Species of, 219, 235.

*Baetis* *atrebatinus*, 229.  
 " *brunneicolor* McD., 221.  
 " *cingulatus* McD., 225.  
 " *flavistriga* McD., 227.  
 " *frondalis* McD., 229.  
 " *hudsonicus* n. sp., 221.  
 " *intercalaris* McD., 227.  
 " *levitans* McD., 225.  
 " *maddunmoughi* n. sp., 230.  
 " *phoebus* McD., 224.  
 " *pluto* McD., 223.  
 " *pygmaeus* Hagen, 230.  
 " *rusticans* McD., 223.  
 " *vagus* McD., 221.

BAILEY, STANLEY F., Article by, 121.

BALCH, R. E., Article by, 1.

*Baris scolopacea* Germ., 31.

BARRETT, J. P., Article by, 73.

*Bassus dorsalis* Prov., 116.

*Bedellia somnulentella* Zell., 104.

Bees of Alberta, II, III, IV, V, The, 33, 86, 113, 126.

*Bessa selecta* Meigen, 248.

*Betheliella calochorti sculleni* n. subsp., 33.

Biology of *Microplectron fuscipennis* Zett., as a Cocoon Parasite of *Diprion polytomum*, Notes on the, 185.

BEIRD, R. D., Article by, 167.

BLANTON, F. S., Article by, 139.

## BOOK NOTICES:

Animal Communities in Temperate America as illustrated by the Chicago Region, 142.

The Biological Control of an Insect in Fiji, 141.

The Biological Control of Insects by Harvey L. Sweetman, 91.

Culture Methods for Invertebrate Animals. A Compendium prepared co-operatively by American Zoologists under the Direction of a Committee from Section F of the American Association for the Advancement of Science, 93.

Der Schwammspinner in Euroasien, Afrika und Neuengland by Dr. Karl E. Schedl, 92.

Forest Insects by R. W. Doane, E. C. Van Dyke, W. J. Chamberlin and H. E. Burke, 93.

Fragments of Entomological History by Herbert Osborn, 94.

## BOOK NOTICES:

- A Glossary of Entomology. Smith's "Explanation of Terms Used in Entomology" completely revised and rewritten by J. R. de la Torre Bueno, 276.
- Insect Wonders of Australia by K. C. McKeown, 142.
- A Manual of Entomological Equipment and Methods. Part II by Alvah Peterson, 165.
- The Origin of Higher Categories in Cynips by Alfred C. Kinsey, 20.
- Source Book of Biological Terms by A. L. Melander, 276.
- Bracon aionus* n. sp., 205.
- " *californicus*, 206.
- " *nigrosternum*, 207.
- " *washingtonensis* n. sp., 206.
- Braconinae from Washington State, 205.
- BROWN, H. D., Article by, 21.
- Brown-headed spruce sawfly, 133.
- BROWN, W. J., Articles by, 106, 158, 170, 193.
- Caenocyrtia* n. gen., 172.
- " *picipennis* Lec., 172.
- Caenurgina convalescens* Gn., 65.
- Caenurgina* n. gen., 65.
- Calliopsis andreniformis*, 97.
- Callopietria floridensis* Gn., 61.
- Capitophorus glandulosus* Kalk., 151.
- " *magnautensis* K.—S., 151.
- " *oestlundii* Knt., 151.
- " *pycnorhynchus* K.—S., 152.
- " *quadririchus* K.—S., 151.
- " *rusticatus* n. sp., 150.
- " , Some Aphids of the Genus, 150.
- " *zoomontanus* K.—S., 152.
- Capnia coloradensis* n. sp., 79.
- " *fumigata* n. sp., 79.
- " *grandis* Banks, 79.
- " *spinulosa* n. sp., 80.
- Cardepiia irrisor* Ersch., 41.
- Chabuata ampla* Wlk., 43.
- CHADWICK, LEIGH E., Article by, 82.
- Chalcopasta acema* Druce, 218.
- Chasmatonotus atripes* n. sp., 253.
- " *bicolor* n. sp., 254.
- " *bimaculatus* O. S., 254.
- " *fascipennis* Coq., 255.
- " *hyalinus* Coq., 255.
- " *maculipennis* n. sp., 254.
- " *unimaculatus* Loew, 254.
- " *univittatus* Coq., 255.
- " with Descriptions of Three New Species, Notes on the Genus, 250.
- Chironomus (Kribioxenus) babiui* n. sp., 274.
- Cirphis costalis* Wlk., 45.
- " *unipuncta* Haw., 231.
- Cixius cultus* Ball, 94.
- CLAASSEN, P. W., Article by, 79.
- Cleoceris discolor* Sm., 130.
- Clocon minor* McD., 242.
- " *simplex* McD., 241.
- " *triangulifera* McD., 241.

- Clostocerus tricornatus* Ashm., 102.
- COCKERELL, T. D. A., Articles by, 33, 86, 113, 126.
- Coconut leaf-mining beetle, 141.
- Coelioxys moesta* Cress., 87.
- Coenonympha ampelos* Edwards, A New Seasonal Form of, 249.
- " *haydenii*, 82.
- " *inornata insulana* McD., 249.
- Colleoptera from Western Canada VI, New, 89.
- " of Canada's Eastern Arctic, The, 106.
- Composite Thrips, *Microcephalothrips abdominalis*, The, 121.
- Congress for Entomology Berlin 1938, Seventh International, 208.
- Copitryophila angelica* Sm., 63.
- Correction, A, 141, 207, 255.
- Cosmobaris sionilli*, 32.
- " *squamiger*, 32.
- Cosmosoma scolopacea americana*, 31.
- Craterestra lucina* Druce, 40.
- Criocephalus agrestis* Kby., 111.
- Cryobius arcticola* Chd., 107.
- Cryptophagus acutangulus* Gyll., 111.
- Cryptus erythropygus* Prov., 116.
- " *gracilis* Prov., 116.
- " *ornatus* Prov., 115.
- " *triannulatus* Prov., 116.
- Gteniscus albilineatus* Walsh, 131.
- " *californicus* Cress., 131.
- " *vitticollis* Cress., 132.
- Cucullinae, Descriptions of New Genera, 127.
- Curtonotus brunnipennis* Dej., 108.
- Cybaeus borealis* Marx, 176.
- " *patritus* Bishop & Crosby, 174.
- " *reticulatus* Simon, 176.
- " *sinuosus* n. sp., 174.
- Cymindis unicolor* Kby., 108.
- Cymolomia ferriferana* Walk., 104.
- Cyrtusa blandissima* Zimm., 171.
- " *Er*, 171.
- " *luggeri* Hatch, 171.
- Dargida graminivora* Wlk., 44.
- " *procincta* Grt., 44.
- Deraeocoris fasciolus* Knt., 146.
- Derris and Pyrethrum, A Review of some recent Experimental Work with, 73.
- Diaborus medius* Cress., 248.
- Diadasia diminuta* Cress., 34.
- Dicestra chartaria* Grt., 41.
- " *florida* Sm., 41.
- Diption fennicus* Forsius, 261.
- " *pallidus* Kl., 261.
- " *polytomus*, 185.
- " , The Morphology of the Adult of, 257.
- " *virens* Kl., 261.
- DOUDOROFF, MICHAEL, Article by, 117.
- Drasteria caerulea* Grt., 65.
- " *cuspidata* Hbn., 66.
- Draudtia revellata* B. & B., 61.
- Drepanaphis sabrinae* n. sp., 111.



- Epelus lutzi* Ckll., 87.  
*Ephialtes variatipes* Prov., 116.  
*Ephoron leukon* Will., and a Discussion of the Imago Instar, The Subimago of, 25.  
*Ephyrodes cacata* Guenee, 219.  
*Epiblema otiosana* Clem., 102.  
*Erastria uncani* L., 64.  
*Erebria avinoffi* Holl., 17.  
     " *callias* Edw., 18.  
     " Critical Notes on the Canadian Species of the Genus, 14.  
     " *disa* Thun., 15.  
     " " *subarctica* n. var., 16.  
     " *discoidalis* Kby., 17.  
     " *epipsodea* Butl., 18.  
     " *fasciata* Butl., 17.  
     " " *suffusa* Warr., 17.  
     " *herscheli* Leuss., 18.  
     " *kuskoquima* Holl., 14.  
     " *mackinleyensis* Gund., 16.  
     " *magdalena* Strecker, 82.  
     " *mancinus* West., 16.  
     " *rossii* Curt., 14.  
     " *steckeri* Holl., 15.  
     " *theano* allaskensis Holl., 18.  
     " " *canadensis* Warr., 18.  
     " " *churchillensis* Warr., 18.  
     " " *dennia* Warr., 18.  
     " " *ethiela* Edw., 18.  
     " " *Tausch*, 18.  
     " *vidleri* Elwes, 14.  
     " *youngi* Holl., 18.  
*Eremobia oeroleuca* Schiff., 60.  
*Eremobina* n. gen., 60.  
*Eriopyga punctula* Gn., 44.  
*Eucirroedia pampina* Gn., 47.  
*Euclidia glyphica* Linn., 66.  
*Euclidimera intercalaris* Grt., 65.  
*Euclidina* n. gen., 66.  
*Eulia mariana* Fern., 145.  
*Eutype albodecorata* Blkmre., 156.  
     " " *confusa* n. var., 156.  
     " " *stygiata* n. var., 157.  
     " *gothicata*, 157.  
*Euphydryas baroni* Edw., 119.  
     " *chalcadona* Dbldy. & Hew., 117.  
     " *colon* Edw., 118.  
     " *cooperi* Behr., 117.  
     " *editha* bayensis n. var., 204.  
     " " *Bdv.*, 118.  
     " " " A race of, 203.  
     " *edithana* Strd., 119.  
     " *irelandi* Gun., 118.  
     " *nubigena* Behr., 118.  
     " *quino* Behr., 118.  
     " *rubicunda* Hy. Edw., 119.  
     " Species, Notes on Californian, 117.  
     " *wheeleri* Hy. Edw., 118.  
*Eupsilia satellitia* Linn., 46.  
*Eustrotia dividua* Grt., 65.  
*Euxoa knoxillea* n. sp., 153.  
     " *messoria*, 154.  
*Euzophora semifuneralis* Wlk., 104.  
  
 FALL, H. C., Article by, 29.  
 FIELD, WILLIAM D., Article by, 249.  
 FOX, IRVING, Article by, 174.  
 FRANCLEMONT, J. G., Article by, 127.  
 Frankliniella moultoni Hood, 121.  
     " *occidentalis* Perg., 126.  
  
 GILLIATT, F. C., Article by, 145.  
 Gortyna flavago D. & S., 61.  
 Gracilaria rhofolella Cham., 103.  
 Grey Banded Leaf Roller, Eulia mariana Fern., in Nova Scotia Orchards, Natural Control of the, 145.  
 GRIEVE, EVELYN GEORGE, Article by, 211.  
  
 Hadena claudens Wlk., 60.  
     " *genetrix* Grt., 59.  
 Halictoides (Parahalictoides) maurus Cresson, 33.  
 Halictus arcuatus Robertson, 88.  
     " (Chloralictus) cressoni Robertson, 114.  
     " " pruinosis Robertson, 113.  
     " " richardsoni n. sp., 113.  
     " *coriaceus* Smith, 89.  
     " *lerouxii* ruborum Ckll., 88.  
     " *nymphaearum* Robertson, 113.  
     " *provancheri* Dalla Torre, 89.  
 Harpalus pennsylvanicus Dej., 47.  
 Heliothis obsoleta Fab., 120.  
 Helophorus arcticus n. sp., 109.  
     " *tuberculatus* Gyll., 109.  
 Hemichroa crocea Geoff., 243.  
 Hemiteles humeralis Prov., 115.  
     " *mucronatus* Prov., 115.  
 Heteroceris aurimicans, 30.  
     " (Littorimus) compactus n. sp., 30.  
 Heterocloeon curiosum McD., 235.  
 Hexagenia recurvata Morg., 25.  
 Hillia maida Dyar, 46.  
     " *senescens* Grt., 46.  
 Holcopasites illinoiensis Robertson, 255.  
     " *stevensi* Cwfd., 99, 255.  
 Homoeosoma electellum Hbst., 120.  
 Homohadena epipaschia Grt., 61.  
 HOPPING, GEO. R., Article by, 243.  
 HOPPING, RALPH, Article by, 89.  
 Horseflies. II The Affinis or "Red-Sided" Group of Tabanus Sens. Lat., with a key to the females, Notes on Certain Males of North American, 35, 49.  
 Hydroporus glabriusculus Aube, 109.  
     " *labradorensis* Fall., 108.  
     " *lapponum* Gyll., 108.  
     " *morio* Aube, 109.  
     " *tartaricus* Lec., 109.  
 Hylaenus albertensis n. sp., 126.  
     " *cressoni* Ckll., 127.  
     " *ellipticus* Kirby, 127.  
     " *modestus* citrinifrons Ckll., 126.  
     " *ziziae* Rob., 126.  
 Hyssia cavernosa Ev., 43.

- Ichneumon Flies with some notes on Synonymy, New Canadian, 189.  
 Ichneumonidae Described by Provancher, Notes on the Types of Some, 115.  
 IDE, F. P. Articles by, 25, 219, 235.  
 Insect Photography, 167.  
 Ischnura verticalis, 211.  
*Isoptera extensa* n. sp., 81.  
     *fulva* n. sp., 80.  
     *petersoni* Needh., 81.  
 Isoplastus fossor Horn, 174.  
     Horn, 173.  
 Jodia rufago Hbn., 129.  
 KNOWLTON, G. F., Articles by, 150, 269.  
 Kribioxenus, A New Species of the Subgenus, 274.  
*Lacinipolia consimilis* n. sp., 183.  
     *egestosa* Draudt, 177.  
     *explicata* n. sp., 181.  
     *illaudabilis* Gnt., 185.  
     *implicata* n. sp., 178.  
     *laudabilis* Gn., 178.  
     *marinitincta appendicula*, n. var. 178.  
     " " Harv., 178.  
     n. gen., 43.  
     *runica* Hamp., 182.  
     *suda* Draudt, 177.  
     *tricornuta* n. sp., 184.  
     *viridifera* n. sp., 182.  
 Laudabilis Group of Lacinipolia, The, 177.  
 LEECH, HUGH B., Article by, 146.  
 Leioididae, Descriptions of Some Genera and Species of, 158, 170.  
 Lemmeria B. & B., 47.  
 Lepidoptera, Undescribed Species and Varieties of, 152.  
 Leptocoris trivittatus Say, 119.  
 Leucania rubripennis Gnt., 45.  
*Lionothus* n. gen., 170.  
     *ulkei* n. sp., 171.  
 Lithacodia caduca form retis Gnt., 69.  
*Lomilysis discolor* Sm., 130.  
     n. gen., 130.  
 Lophyrus hercyniae Hartig, 257.  
*Ludius (Corymbites) kaviana* n. n., 31.  
*Ludius (Corymbites) rufipennis* Fall, 3.  
     *umbripennis* Lec., 30.  
*Lycanades* n. gen., 128.  
     *pulchella* Sm., 128.  
 Macromia alleghaniensis Wmsn., 12.  
     *annulata* Hagen, 13.  
     *australensis* Will., 7.  
     from British Columbia, A New, 5.  
     *georgina* Say, 13.  
     *illinoensis* Walsh, 12.  
     *magnifica* McLach., 7.  
     *pacifica* Hagen, 7.  
     *rickeri* n. sp., 7.  
     *taeniolata* Rambur., 13.  
     *wabashensis* Wmsn., 13.  
 Macrosiphum ambrosiae Thomas, 271.  
     " Aphids Infesting Chrysanthamus and Gutierrezia, 269.  
     " chrysanthemi Oest., 269.  
     " escalantii Knlt., 269.  
     " glabrum G. & P., 271.  
     " packi Knlt., 272.  
     " sporadicum Knlt., 272.  
     " zerogutierrezis n. sp., 272.  
*Molachius antennatus* n. sp., 90.  
     " hornii Fall, 90.  
 Mamestra albicollis Sepp., 42.  
     *hadeniformis* Sm., 41.  
     " *illaudabilis* Gnt., 43.  
 MANK, EDITH W., Article by, 18.  
 MARSHALL, G. EDW., Article by, 100.  
 McDUNNOUGH, J., Articles by, 14, 40, 58, 77, 141, 152, 177.  
*Meliana flammica* Curt., 45.  
*Melipotis cellaris* Guenee, 219.  
     *contorta* Guenee, 218.  
     " *januaris* Guenee, 218.  
     " *perpendicularis* Guenee, 219.  
     " *prolata* Walker, 219.  
 Meroptera pravella Grote, 103.  
 Mesoleptus largus, 191.  
 Metator paradalinus Sauss., 120.  
*Metaxaglaea* n. gen., 129.  
     " *viatica* Gnt., 129.  
 Meteorus tetraphae Mues., 101.  
 Micralymma brevilingue Schiodte, 110.  
 Microcephalothrips abdominalis Crawford, 121.  
 Microlepidoptera of Southern Indiana, and their Parasites, A Progress Report on the, 100.  
 Microplectron alaskensis Ashm., 131.  
     " *fuscipennis* Zett., 185.  
 MILLEP, FORREST W., Article by, 111.  
 MILLS, HARLOW B., Article by, 67.  
*Miracavira* n. gen., 130.  
     " *sylvia* Dyar, 130.  
 Miselia compta Fabr., 43.  
 Momaphana sylvia Dyar, 130.  
 MORRISON, F. O., Article by, 266.  
 Mouralia tinctoides Guenee, 218.  
 Muscles of the head Stomodeum of an Odonate Nymph, Ischnura verticalis, The, 211.  
 MUSGRAVE, LESTER I., Article by, 100.  
 Myiasis in the foot of a Rat by Wohlfahrtia meigenii Schiner, 266.  
 Myzus persicae Sulzer, 208.  
 Nacerda melanura L., 1.  
*Neleucania bicolorata*, 44.  
     " *niveicosta*, 44.  
*Neocyrta insolita* n. sp., 170.  
     n. gen., 161.  
     " *obsoleta* Melsh., 163.  
     " *potens* Brown, 165.  
     " *puritana* Fall, 164.  
     " *secreta* n. sp., 163.  
     " *superans* Fall, 164.  
*Neodipcion sertifer*, 262.  
*Neocrastris* n. gen., 64.  
*Neperigea albimacula* B. & McD., 62.  
     n. gen., 62.  
     " *niveirena* Harv., 62.

*Nerastria* n. gen., 65.

# NEWS AND VIEWS:

Another big Grasshopper year Indicated by Surveys in Western United States, 71.

Annual Meeting of the Entomologist Society of British Columbia, 96.

29th Annual Meeting of the Quebec Society for the Protection of Plants, 166.

Autogiros and Chemicals used in Campaign to save Elms, 187.

Changes in U. S. Mexican Fruit Fly Quarantine, 23.

Deaths of Prominent Entomologists, 71.

Dominion Department of Agriculture to make Distribution of Rust Resistant wheat seed, 96.

Dr. P. N. Annand to be Research Assistant to Chief of the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, 208.

European Tour, 277.

Hessian fly Infestations low in winter wheat belt but unusually numerous in some northern areas of the United States, 209.

Japanese beetle Quarantine Regulations Revised, 144.

Lyman Entomological Collection, 143.

Mr. Erle G. Brewer named head of Japanese Beetle Control and Dutch Elm Disease Eradication Program in the United States, 234.

New Chemicals Promise aid in Insect Control, 71.

Recent Deaths, 120, 276.

Report on the Montreal Branch Entomological Society of Ontario, 277.

Sap Stream Carries Poison to Control Beetles in Trees, 23.

Strong Suggests Insect Exterminators go after pests on the Farm, 233.

The 73rd Annual Meeting of the Entomological Society of Ontario, 22.

The 74th Annual Meeting of the Entomological Society of Ontario, 278.

Traps and poison show some Gains over Japanese beetle, 144.

U. S. Revokes Satin Moth Quarantine, 24.

Noctuid Genera, Notes on North American, 40, 58.

Noctuids in North America, Notes on Some Tropical, 218.

North American Fly Belonging to the Genus *Rivellia*, A New, 139.

Notes and Descriptions (Coleoptera), Miscellaneous, 29.

OBITUARY: Harold Benjamin Fantham, 255.

Joseph Perrin, 219.

*Oeneis chryxus*, 84.

*Oligia strigilis* Cl., 59.

*Olophrum boreale* Payk., 110.

*Oncopodura*, A North American, 67.

" *crassicornis* Shoebottom, 69.

" *hamata*, Carl & Lieb., 69.

" *jugoslavica* Abs. & Ksen., 69.

" *occidentalis* Bonet, 69.

" *oculata* n. sp., 67.

*Orius tristicolor* White, 126.

*Ornix geminatella* Pack., 101.

*Orthodes infirma* Gn., 44.

*Orthosia hibisci* Gn., 44.

" *incerta* Hfn., 44.

" *inops* Grt., 46.

" *viatica* Grt., 129.

*Pachynematus ochreatus*, 133.

*Pallodes obsoletus* Melsh., 161.

*Panthea acronyctoides albosuffusa* n. var., 153.

*Panthea furcilla pallescens* n. var., 153.

Panurgine Bees, Notes on the Biology of Two, 97.

*Panurginus borealis* n. sp., 33.

" *gerardiae* Crawl., 34.

" *labrosiformis* Rob., 114.

" *nebrascensis* Crawford, 114.

" *pauper* Cress., 33.

" *pecki* n. sp., 114.

" *perlaevis* Ckll., 33.

" *piepcei albertensis* n. subsp., 33.

" *stevensi* Crawl., 34.

*Panurgus maurus*, 33.

*Paracynus longulus* Fall., 30.

*Parastichtis suspecta* Hbn., 46.

*Pasimachus punctulatus* Hald., 48.

PECK, O., Article by, 275.

*Perdita bruneri* Ckll., 34.

" *cockerelli* Crawl., 34.

*Perigea continens* Hy. Edw., 62.

" *xanthioides* Gn., 61.

*Phaenicia oenotherana* Riley, 105.

Phasmiid Injury to the Human Eye, 84.

*Phauis nigra* n. sp., 89.

" *riversi* Lec., 90.

" *splendens* Linna., 90.

PHILIP, CORNELIUS B., Articles by, 35, 49, 207.

*Philocterus (Cummingsella) longirostricola* n. sp., 264.

" (Malkophaga) from the Long-billed Curlew, A New Species of, 264.

" *testudinarius*, 265.

*Phygadeuon guignardi* Prov., 116.

*Phyllonorycter malimalifoliella* Braun, 104.

*Phyllophaga gracilis* Burm., 70.

" *longispina* Sm., 70.

" *microdon* Fall., 31.

" *pusillidens* n. n., 31.

*Phytometra apicosa* Haw., 64.

*Pissonotus brunneus* V. D., 94.

*Platypedriga amotha* Dvar, 62.

*Podisus maculiventris* Sav., 146.

*Polia dysodea* Schiff., 42.

" *nebulosa* Hfn., 42.

*Polyterus albipectus* n. sp., 192.

" *olympiae* Ashm., 192.

- Promecotheca reichei* Baly, 141.  
*Prorachia daria* Druce, 63.  
*Protolenania* n. n., 141.  
*Protoperigea* n. gen., 62.  
*Provancherella rhopalocera* Prov., 191.  
*Pseudanarta pulverulenta* Sm., 46.  
*Pseudocloeon carolina* Banks, 241.  
     " *cingulatum* McD., 236.  
     " *dubium* Walsh, 237.  
     " *parvulum* McD., 236.  
     " *punctiventris* McD., 237.  
     " *virile* McD., 239.  
*Pseudohadena vulnifera* Grt., 61.  
*Pseudoleucania albilinea*, 45.  
*Pseudoleucania* n. gen., 45.  
     " *quadrannulata* Morr., 45.  
     " *Staud.*, 141.  
*Psorosira hammondi* Riley, 101.  
*Pyreferra* n. gen., 129.  
     " *pettiti* Grt., 130.  
 Pyrethrum, A Review of Some Recent Experimental Work with Derris and, 73.  
  
*Rancora comstocki* n. sp., 77.  
     " from the Mohave Desert, A New, 77.  
     " *matricariae* Strecker, 77.  
     " *serraticornis* Lint., 77.  
 Ratio of Striped Larvae and a Modifying Factor, Mendelian 3-1, 137.  
 REEKS, W. A., Articles by, 185, 257.  
 REMPEL, J. G., Articles by, 250, 274.  
 RESEARCH NOTES:  
     Bombarding beetles of the genera *Harpalus* and *Posimachus*, 47.  
     Costal Vein in Pieridae, 48.  
     Discovery of an Autumn host plant of *Myzus persicae* Sulzer, 208.  
     Fulgoridae (Homoptera) Taken in Alberta, 94.  
     Interesting Moths Collected at Grand Bend, Ontario, 1936, 69.  
     Note in regard to the flight period of June beetles at Grand Bend, Ontario, 1936, 69.  
     Note on Boron Deficiency in Sugar Beets, 21.  
     Note on Marten's Types of Western Horseflies, 94.  
     Outbreak of Armyworms (*Cirphis unipuncta* Haw.) in Saguenay County, Quebec, 231.  
     Records of Northward Migration of Southern insects during Drought years, 119.  
*Rhodoccia aurantiago* Gn., 69.  
 RICHARDS, A. GLENN, JR., Article by, 218.  
*Rivellia micans* Loew, 139.  
     " *severini* n. sp., 139.  
  
 Satin moth, 24.  
 Satyrinae, Two Types of Venational Aberration in the, 82.  
 Sawfly Biologies, No. 2, *Hemichroa crocea* Geoffroy, 243.  
*Scotops hesperius* Uhl., 94.  
*Scopelosoma pettiti* Grt., 130.  
  
*Scotogramma crotchii* Grt., 154.  
     " *oaklandiae* n. sp., 154.  
     " *trifolii*, 154.  
 Septis Hbn., 58.  
 SHENEFELT, ROY D., Article by, 205.  
*Sideridis congermana* Morr., 69.  
*Simplocaria tessellata* Lec., 111.  
*Smicroplectrus albilineatus* Walsh, 136.  
     " *annulipes* Cress., 132.  
     " *apicatus* Prov., 135.  
     " *dissectus* Wly., 136.  
     " *in Canada, The Genus*, 131.  
     " *incompletus* n. sp., 134.  
     " *robustus* n. sp., 135.  
     " *velox* n. sp., 132.  
 SMITH, C. F., Articles by, 150, 269.  
*Spartiniphaga includens* Wlk., 60.  
     " n. gen., 46.  
 Spruce sawfly, 257.  
*Spudaea ovalis* Davis, 248.  
*Stereocerus haematopus* Dej., 108.  
 STERNITZKY, R. F., Article by, 203.  
 STEWART, M. A., Articles by, 84, 273.  
*Stilpnolia salicis* L., 24.  
*Stilpnus appendiculatus* Prov., 115.  
*Stiphrosomus clinatus* n. sp., 190.  
     " *depressus*, 190.  
     " *fuscatus* Cress., 190.  
 Stoneflies, New Species of, 79.  
*Stylopoda cephalica* Sm., 45.  
*Sythesis impositella* Zell., 103.  
  
*Tabanus affinis* Kby., 36.  
     " *atrobasis* McDun., 36.  
     " *californicus* Mart., 37.  
     " *captonis* Mart., 37.  
     " *carolinensis* Macq., 37.  
     " *cristatus* Cur., 37.  
     " *daeckei* Hine, 38.  
     " *epistates* O. S., 39.  
     " *frontalis* Wlk., 55.  
     " *gracilipalpis* Hine, 39.  
     " *haemaphorus* Mart., 39.  
     " *hinei* Johns., 39.  
     " *illotus* O. S., 39.  
     " *lasiophthalmus* Macq., 40.  
     " *liorhinus* Philip, 53.  
     " *longiglossus* Philip, 40.  
     " *melanorhinus* Big., 40.  
     " *metabolus* McDun., 49.  
     " *minusculus* Hine, 50.  
     " *nudus* McDun., 50.  
     " *opacus* Coq., 50.  
     " *patulus* Wlk., 37.  
     " *phaenops* O. S., 51.  
     " *rhombicus* O. S., 54.  
     " *rupestris* McDun., 50.  
     " *sonomensis* O. S., 51.  
     " *hetricus* var. *rubrilatus* Philip, 35.  
     " *trepidus* McDun., 51.  
     " *zygotus* n. sp., 52, 207.  
*Takiosea discivaria* Wlk., 46.  
*Tegenaria derhamii* Scopoli, 176.  
     " *praegrandis* n. sp., 176.  
*Thrasia desertorum* n. sp., 273.  
     " *Species (Siphonaptera) from California, A New*, 273.

- Thrips femoralis Jones, 121.  
     " microcephalus Priesner, 121.  
 Tischeria malifoliella Clem., 101.  
 Trachea atriplicis L., 59.  
     " delicata Grt., 59.  
 Trichoclea nova Sm., 41.  
 Trichogramma minutum, 146.  
 Tridepia n. gen., 41.  
 Triepeolus helianthi Robertson, 86.  
     " stricklandi n. sp., 86.  
 Tropaea luna, 137.  
 Trudestra n. gen., 41.  
 Tylostypia laticornis, 35.
- Urocerus albicornis F. and U. flavicornis  
     F., The Males of, 275.  
     " flavicornis F., 275.
- WALKER, E. M., Article by, 5.  
 WALLEY, G. STUART, Articles by, 115, 131,  
     189.
- Wharf Borer (Nacorda melanura L.) Notes  
     on the, 1.  
 WICKWIRE, HARRIET A., Article by, 137.  
 WILSON, F. H., Article by, 264.  
 Wohlfahrtia magnifica Schin., 268.  
     " meigenii Schin., 266.  
     " vigil Walk., 268.
- Xanthia pulchella Smith, 128.  
     " puta G. & R., 128.  
 Xenoglossodes albertensis n. sp., 87.  
 Xylita laevigata Hellenius, 19.  
     " livida Sahlbg., 19.  
 Xylitas, A Note on Two Species of  
     American, 18.  
 Xystopeplus n. gen., 128.  
     " rufago Hbn., 129.
- Zenillia blanda O. S., 145.  
 Zootermopsis angusticollis Hagen, 5.

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